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EXAMINER	
DANG, HUNG Q	

ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/549,277	HUANG ET AL.	
	Examiner	Art Unit	
	HUNG Q. DANG	2612	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 November 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,5-21,24-28 and 34-42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,5-21,24-28 and 34-42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 September 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to application's claim amendments dated 11/5/2008. The amendments of claims 1, 5, 16, 21, 28; the cancellation of claims 2-4, 22-23, 29-33; and the addition of claims 36-42 have been entered.

Note: Claim 1 does not show any marked-up changes. However, the Applicant's remarks indicates that the previously recited limitation "amplitude modulation" of claim 1 has been omitted. Therefore, in this office action, the Examiner will treat the recited limitation "amplitude modulation" as being omitted in claim 1.

Response to Arguments

2. Applicant's arguments with respect to claims 1, 5-21, 24-28 and 34-42 have been considered but are moot in view of the new ground(s) of rejection.

Regarding the Applicant's argument with the combination of the Dubinsky and Priest et al. references; the Applicant argues that the transducer disclosed by Priest et al. is not powered by an acoustic wave transmitted from the surface and therefore it can not be combined with Dubinsky. The Examiner disagrees with the Applicant. Priest et al. teaches the conversion of received acoustic energy into electrical energy and also the conversion of electrical energy into acoustic energy. Priest et al. also suggests using piezoelectric elements(s) to increase the voltage response to the received acoustic energy, which results in increasing amplitudes of generated acoustic signals (see column 1 line 60 to column 2 line 22). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a

piezoelectric actuator to the modulator disclosed by Dubinsky in view of Shi et al., as evidenced by Priest et al., so that more voltage/power can be generated through the use of said piezoelectric actuators, which results in an increasing amplitude of a generated acoustic signal (see column 1 line 60 to column 2 line 22).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 5-17, 20, 21, 24-26, 28 and 36-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dubinsky U.S. Patent 6,757,218 in view of Shi et al. U.S. Pub. 2002/0180613.

Note: according to page 8 lines 12-16 and page 10 lines 15-26 of the specification, the claimed modulator in claim 1 is a stop valve that opens or blocks the access to the liquid volume (132)..; and together with the Helmholtz resonator...the reflected wave becomes a BPSK (binary phase shift key) modulated wave, carrying data to the surface.

Regarding claims 1, 16 and 38, Dubinsky teaches an acoustic telemetry apparatus for communicating digital data from a down-hole location through a borehole to the surface comprising (see figure 2):

an acoustic channel (figure 2, channel 204) terminated at a down-hole end by a reflecting terminal (figure 2, unit 208);

an acoustic wave generator located at the surface and providing an acoustic wave carrier signal within said acoustic channel (column 4, lines 36-45);

a modulator located at said down-hole location and adapted to modulate said carrier wave in response to a digital signal (paragraph bridging columns 4-5); and

one or more sensors (figure 2, unit 214) located at the surface adapted to detect related modulated information of acoustic waves traveling within said acoustic channel.

However, Dubinsky teaches amplitude modulation of the carrier wave instead of phase modulation; and therefore, Dubinsky does not teach that the modulator and the reflecting terminal form a phase shifting reflector for the carrier wave, switchable between a first state which reflects the carrier wave and a second state which reflects the carrier wave with a shift in phase relative to reflection by said first state.

Shi et al., in the same field of endeavor, teaches an acoustic borehole telemetry system. Shi et al. shows that amplitude modulation and BPSK modulation have been conventionally known and applied in downhole acoustic communication systems; and that in binary phase shift keying (BPSK) modulation, the phase of a constant amplitude carrier signal is switched between two values according to the two possible values of a binary digit, corresponding to binary 1 and 0, respectively (see paragraph [0047]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to alternatively substitute the amplitude modulation of the system disclosed by Dubinsky with BPSK modulation, as evidenced by Shi et al., so that data can be modulated using BPSK and transmitted to the surface. Since, the substitution of amplitude modulation with BPSK modulation has been shown to be obvious; the provision of the modulator and the reflecting terminal forming a phase shifting reflector for the carrier wave, switchable between a first state which reflects the carrier wave and a second state which reflects the carrier wave with a shift in phase relative to reflection by said first state, would also be obvious to one of ordinary skill in the art, as already suggested by Shi et al. (see paragraph [0047]).

Regarding claim 5, according pages 8-10 of the specification...the modulator comprises a Helmholtz resonator…and when the Helmholtz resonator is enabled…the acoustic impedance at the down-hole end of the annulus equals that of the resonator, and the reflected wave is phase-inverted; when disabled, the reflected wave has no phase change.

Dubinsky also teaches the same concept (paragraph bridging columns 4-5) of switching between a first state that cases the phase of an acoustic wave reflected at said terminal to invert and a second state that maintains the original phase of the incident wave by operating the modulator (valve) and the Helmholtz resonator as described on pages 8-10 of the specification of this application.

Regarding claim 6, the acoustic channel disclosed by Dubinsky is also a column of liquid extending from the surface to a down-hole location (column 4, lines 36-48).

Regarding claim 7, the acoustic channel disclosed by Dubinsky is also formed by filling an annular volume in the borehole with a liquid (figure 2 and column 4, lines 36-48).

Regarding claim 8, Dubinsky also teaches that the acoustic channel is formed by filling a tubing string suspended in the borehole with a liquid (column 4, lines 36-46).

Regarding claims 10 and 24, the modulator disclosed by Dubinsky is also a Helmholtz resonator located in the vicinity of the reflecting terminal point (paragraph bridging columns 4-5).

Regarding claim 11, the resonator disclosed by Dubinsky also comprises a liquid filled volume enclosed in a housing having a tubular opening to the reflecting terminal (column 5 lines 39-55; the tubular openings in this case are the controlled pistons).

Regarding claim 12, the resonator disclosed by Dubinsky also has two or more tubular openings to the reflecting terminal (column 5 lines 39-55; the tubular openings in this cases are the controlled pistons).

Regarding claim 14, Dubinsky also teaches an acoustic receiver (figure 2, unit 210) in a downhole location adapted to receive acoustic channel in a down-hole location.

Regarding claim 15, the digital data disclosed in Dubinsky's system is also encoded digital data (see figure 2).

Regarding claim 17, the sensors disclosed by Dubinsky are also connected to a signal processing unit adapted to filter the carrier wave signal from detected information (column 4, lines 44-46).

Regarding claim 20, Dubinsky also teaches the use of the apparatus of claim 1 in a well stimulation operation. The well stimulation operation in this case is the operation of the downhole Helmholz resonator being resonated by the received acoustic signal.

Regarding claims 21, 28, 40 and 42, claims 21, 28, 40 and 42 recite the steps of operating the acoustic telemetry apparatus of claim 1; and therefore are rejected for the same reasons stated above.

Regarding claim 25, Dubinsky also teaches the steps of performing measurements of downhole parameters; encoding said measurements into a bitstream; and controlling the reflecting properties of the reflecting terminal in response to said encoded bitstream (column 7, lines 34-50).

Regarding claim 9, even though Dubinsky does not specifically that the column of liquid has a viscosity of less than 3 x 10^(-3) NS/m^2, however, it would have been obvious to one of skilled practitioner to derive such viscosity through routine experimentations to achieve an optimal liquid channel for said acoustic data transmission.

Regarding claim 13, even though Dubinsky does not specifically teach that the acoustic wave generator is adapted to simultaneously generate acoustic waves at different frequencies, however, one of ordinary skill in the art at the time the invention

was made would recognize that if a downhole data receiver is desired, then a different acoustic signal, which has a different frequency from the frequency of the acoustic signal that is used to resonate the downhole resonator, can be used to transmit control data to the downhole receiver just like in any other conventional downhole telemetry systems.

Regarding claims 26 and 37, even though Dubinsky does not specifically mention the step of selecting the frequency of the carrier wave such that it is close to the resonance frequency of the resonator used to modulate said carrier wave, however, one of ordinary skill in the art would recognize that Helmholz resonator optimally operates at its resonant frequency. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the step of selecting the frequency of the carrier wave such that it is close to the resonant frequency of the resonator so that the resonator can be resonated (enabled) to modulate the carrier wave.

Regarding claims 36, 39 and 41, even though Dubinsky in view of Shi et al. does not specifically disclose that the acoustic wave carrier signal is continuous, however, one of ordinary skill in the art would recognize that if data is desired to be continuously transmitted and received, then clearly, the acoustic wave carrier signal would have to be continuous.

Regarding claim 27, Dubinsky in view of Shi et al. teaches the method of claim 21. However, Dubinsky in view of Shi et al. does not teach the steps of scanning through a range of possible carrier frequencies; monitoring at the surface reflected and

modulated wave signal; selecting the frequency of the carrier wave such that the detection of said reflected and modulated wave signal is optimized; and commencing the communication of down-hole measurements.

The claimed steps are merely the conventional method of selecting an optimal frequency through a range of possible frequencies to achieve optimal data transmission with minimal noise and interference. The Examiner gives Official Notice that such frequency selecting method has been commonly known and applied in many acoustic communication systems in order to optimize data transmission with minimal noise and interference.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide such frequency scanning steps to the method disclosed by Dubinsky in view of Shi et al. so that optimal acoustic transmission can be achieved.

5. Claims 18-19 and 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dubinsky U.S. Patent 6,757,218 in view of Shi et al. U.S. Pub. 2002/0180613, as applied to claim 1, and in view of Priest et al. U.S. Patent 5,444,324.

Regarding claim 19, Dubinsky in view of Shi et al. does not specifically mention that the downhole power generator is adapted to convert acoustic energy from an acoustic wave signal generated at the surface.

Priest et al., in the same field of endeavor, discloses the conventionality of using down-hole power generator that is adapted to convert acoustic energy from an acoustic wave signal generated at the surface (column 1, lines 20-24).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the conversion of the received acoustic wave signal into electrical signals for use as the downhole power generator disclosed by Dubinsky in view of Shi et al., as suggested by Priest et al.

Regarding claim 18, Dubinsky in view of Shi et al. teaches the apparatus of claim 1. However, Dubinsky in view of Shi et al. does not specifically teach wherein the modulator comprises a piezoelectric actuator.

Priest et al., in the same field of endeavor, teaches a downhole acoustic telemetry apparatus and Priest et al. also discloses the conventionality of using piezoelectric element(s) to increase the voltage response to acoustic energy (column 1, lines 65-67).

As mentioned in the rejection of claim 19, Dubinsky in view of Shi et al. and Priest et al. teaches the conversion of the received acoustic wave signal into electrical signals for use as the downhole power generator. Since Dubinsky teaches a downhole apparatus which uses acoustic energy transmitted from the surface to actuate/modulate a downhole transmitter; and Priest et al. further suggests using piezoelectric elements(s) to increase the voltage response to the received acoustic energy. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a piezoelectric actuator to the modulator disclosed by

Dubinsky in view of Shi et al., as evidenced by Priest et al., so that more voltage/power can be generated through the use of said piezoelectric actuators, which results in an increasing amplitude of a generated acoustic signal (see column 1 line 60 to column 2 line 22).

Regarding claim 34, Priest et al. also discloses the conventionality of using an electro-acoustic transducer to convert the energy of the received acoustic wave into electrical energy for the down-hole power generator to provide power to the down-hole tools (column 1, lines 16-45).

Therefore, by conventionality, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an electro-acoustic transducer to the downhole generator disclosed by Dubinsky in view of Shi et al., as disclosed by Priest et al., so that downhole tools can be powered up by using acoustic-converted electrical energy.

Regarding claim 35, the Examiner gives Official Notice that capacitors have been commonly known and used for storing electrical energy. Therefore, it would have been obvious to provide an energy storing capacitor to the downhole power generator of the system disclosed by Dubinsky in view of Shi et al. to store electrical energy to provide energy/power to one or more downhole devices.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to HUNG Q. DANG whose telephone number is (571)272-3069. The examiner can normally be reached on 9:30AM-6PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Zimmerman can be reached on (571) 272-3059. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Hung Q Dang/
Examiner, Art Unit 2612

/Brian A Zimmerman/
Supervisory Patent Examiner, Art Unit 2612